

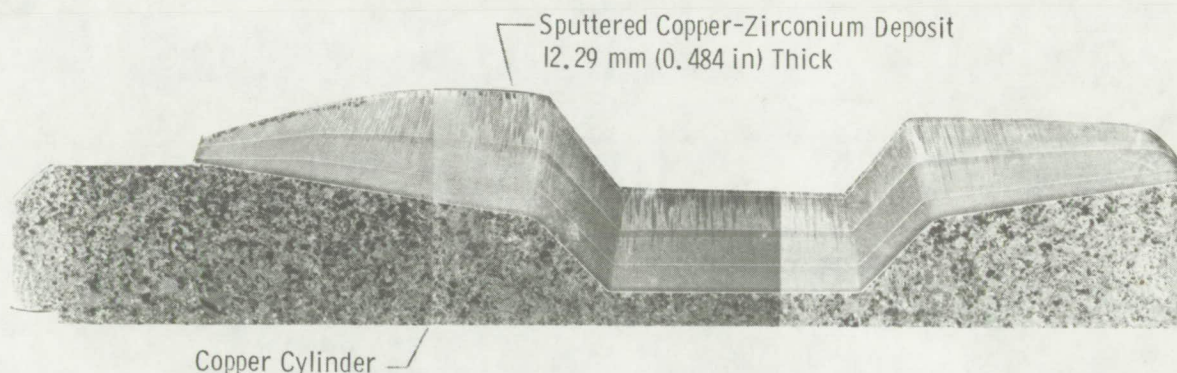
# NASA TECH BRIEF

## *Lewis Research Center*



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### Fabrication of Thick Structures by Sputtering



Continuing development of the sputtering process has demonstrated the practicality of sputtering for fabricating thick structures.

Rocket engine thrust chambers are complex-shaped structures with intricate internal passages. Severe operating regimes dictate the selection of materials and require very high structural integrity. These conditions have necessitated the development of advanced fabricating processes.

Electroforming has been employed successfully in fabricating thrust chambers and similar structures, however, materials which can be electro-deposited consist of essentially pure metals such as copper or nickel.

The sputtering process can deposit a wide range of metals, alloys and non-metallic materials with excellent adherence and structural integrity. Sputtering is being used increasingly to apply coatings and plating, both in research and in manufacturing. Initially, sputtering has been used to apply thin films of various materials. Continuing advancements have now demonstrated the feasibility of fabricating thick structures by sputtering.

During an investigation of the properties of sputter-deposited copper alloys, a 5500-gram deposit of Cu-0.15 wt % Zr alloy was sputtered onto a copper cylinder to an average thickness of 12.29 mm (0.484 in), as shown in the figure. The structure was achieved with high-rate sputter deposition for about 100 hours total sputtering time. The sputtered material had twice the strength of the same unsputtered material at temperatures to 723 K (842°F) and equivalent strength at nearly 873 K (1112°F).

#### Notes:

1. Further information is available in the following report:

NASA CR-134542 (N74-27021), Property Investigation and Sputter Deposition of Dispersion-Hardened Copper for Fatigue Specimen Fabrication

- Copies may be obtained at cost from:

Aerospace Research Applications Center  
Indiana University  
400 East Seventh Street  
Bloomington, Indiana 47401  
Telephone: 812-337-7833  
Reference: B74-10126

2. Specific technical questions may be directed to:

Technology Utilization Officer  
Lewis Research Center  
21000 Brookpark Road  
Cleveland, Ohio 44135  
Reference: B74-10126

3. A description of the sputtering process, its capabilities and some of its applications is available in the following report:

NASA SP-5111, Sputtering and Ion Plating  
Copies may be obtained from the Aerospace Research Applications Center (address above).

(continued overleaf)

**Patent Status:**

Inquiries concerning rights for the commercial use of  
this invention should be addressed to:

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